Bicycle Building and-or Riding

How to build a bicycle built for two out of two built for one

You can team up and build a tandem in 11 steps.

by Eugene A. Sloane

Until you ride a tandem you will never know the joy a bicycle can bring to the two of you. You can comment on the passing scene without having to shout or ride dangerously close together to be heard. Two-up riding is easier because two wheels instead of four offer less rolling resistance, and the tandem weighs less than two single bikes. When the wind is gusty a tandem is far steadier and easier to pedal than a single bike.

The trouble with tandems is their great expense. You can buy one that sells for as little as $150 but it weighs almost twice as much as the one you can build yourself, and looks, rides and feels like a truck. A really good ready-built tandem sells for upwards of $750. You should be able to build this lightweight, comfortable and responsive tandem for a maximum of $390 out-of-pocket and a minimum of $190 if you use less costly components. You can cut costs still further if you already have some of the parts such as saddles, wheels, tires, tubes, frames, derailleurs, brakes and handlebars from old bikes. The old frames you will need you can often scrounge from local bike shops which have no need for wrecked frames.

How to ride a tandem

If you follow all the build-it steps, you should have a high quality tandem with excellent shock-absorbing and steering qualities for long dis-

(Please turn to page 44)

TOOLS YOU WILL NEED

- Brazing outfit, with a dozen or so 1/16-inch bronze rods and brazing flux. I prefer the Tote-Weld Mapp gas outfit made by Airco which costs about $125 including tanks of Mapp gas and oxygen, rods, lighter, safety goggles and carrying case. The Mapp gas replacement cylinders are available from Sears, Roebuck and you can get oxygen from any welding supply house. A very adequate brazing and welding manual comes with the Tote-Weld set-up, and you can learn to braze from it.
- Metal-cleaning equipment, including flat and rat-trail files, sandpaper and a ½-inch carbide burr bit.
- Hacksaw and blades.
- Frame alignment equipment. This includes a carpenter's level, 4-foot straightedge, ruler, roll of twine, I.D. and O.D. caliper rule.

PARTS YOU WILL NEED

- Two frames, preferably of high quality tubing such as Reynolds '531', Columbus, Super-Vitus or Vitus. Try to get a man's frame for the front and a woman's frame for the rear that fits your "stoker." If all you can get are two men's frames, steps here show you how to convert one to a woman's step-through frame. Rear frame can have a bent fork, since you need but one. Front frame fork must be straight, as should all main tubes. Prices vary according to how bad they are wrecked and the steel they are made of. Certainly $50 for a pair of old, beat-up frames should be reasonable.
- A pair of caliper brakes with levers and one short and one extra-long tandem length cable for the rear brake. Mafac brakes are very adequate, cost about $18 with levers. Extra long cable, about $2.
- Three seat-post lugs, about $2 each from Proteus Designs, Inc., 9225 Baltimore Blvd., College Park, Md. 20740. Give O.D. of old front frame seat tube and rear frame down tube to get fit—73° lugs are fine.
- Headset (if you need one for front frame). These are all cups, bearings and locknut. Measure I.D. of head tube to get set that fits. Strong-light headset is fine, for about $8.
- Pedals. Two pair of reasonably high-quality-alloy body pedals, such as KKT, with toe clips and straps. These must be threaded to fit your cranks. About $60 for two pairs.
- Wide gear-ratio rear derailleur and two front derailleurs (one for chain tensioner). Any Shimano GS rear derailleur will do. With dual down-tube levers, cables and stops, about $35. One extra rear derailleur wheel (for tensioner), $1.
- One front and one rear wheel with steel rims, bolt-on hubs, 1¼x27-inch tires and tubes. $50.
- Five-speed rear freewheel, 14-34 teeth preferred, such as made by Shimano. $11.
- Special Schwinn stem for rear handlebar; fastens on rear seat post. Schwinn Part No. 55-755. $8.50.
- Fork. This should come with one of the frames. If not, measure length of head tube, buy a fork about 1 inch longer and threaded same as headset threads. New forks come to fit largest frame, cost about $30. It is the practice to cut them to fit smaller frames.
- Chainwheels and bottom-bracket sets. You can use old chainwheels, *only* if the chainwheels to be used with the chain connecting front bottom bracket to rear bottom bracket have the *same number of teeth*. If not, rotation of each crank will be at different speeds and front and rear pedals will collide after one or two revolutions.

If you use old chainwheels, you can have only a five-speed tandem—okay with a wide gear-ratio freewheel. If you buy new bottom-bracket and chainwheel sets, use the T.A. special tandem set designed for tandems. It includes bottom-bracket sets (spindles, cups and cranks) front and rear, and gives you a 10-speed tandem. The T.A. set costs about $125. You provide bearings, 11 to a side (total 44 ¼-inch bearings). If you use old chainwheels designed for a one seater, you'll have to shim out the rear set to allow for chain clearance. Conventional chain ring sets were not designed to carry two chains at once, one chain on each ring. Longer washers or spacers and fixing bolts are available from good bike stores to fit most chainwheel makes.

- Two chains. This is the derailleur ½ x 3/32-in. chain with 122 links. Make sure the bike store has extra links to fit the same make of chain; you may need them. About $11 for both chains.
- Two saddles and seat posts. I prefer leather saddles with steel seat posts. About $30 with posts for both saddles.

You can spend much more than indicated here if you upgrade to the finest components. I have tried to compromise between price and quality.

Before listing tools you'll need to build a tandem, I want to make two assumptions. One is that you know how to disassemble, reassemble and adjust every part of a bicycle. If not, I suggest you read my book, *The New Complete Book of Bicycling*, $12.95, 550 pages, Simon & Schuster. The second assumption is that you know how to braze metal. If not, I suggest you stick to the Mapp gas outfit listed.

BUILD A BICYCLE FOR TWO

(Continued from page 43)

tance touring comfort. Now, some advice about riding your new tandem. Learn to coordinate push-off from a standing start. Pedals on one side should be at two o'clock. Push down on that pedal and push up into the saddle and pedal a few strong strokes to get going. Stop for a second and get the other foot into the toe clips. Never stop pedaling without warning the other rider, never turn without letting the "stoker" at the rear know about it, never stop without informing the stoker. The stoker should never shift bodily weight because this can throw the front man off balance, especially during a turn. Some shifting about is okay, but don't overdo it. If you get along well in other departments, you should be a joy to each other and to watch you harmoniously pedal away!

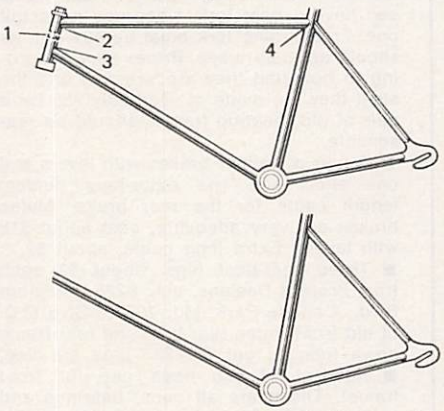
Now here are the steps for building the tandem:

Step one

Remove all parts from both frames except fork from the front frame.

Step two

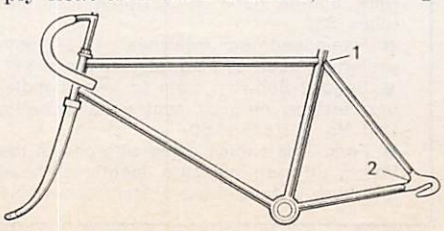
Prepare the rear frame section. Cut headtube in two places (dotted lines

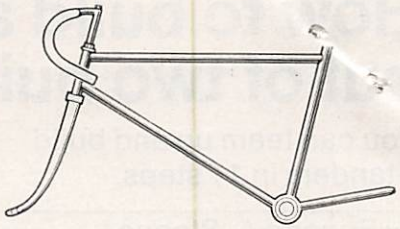


on drawing) at Point 1. With torch, unbraze and remove headtube and top tube. Apply heat to Points 2, 3 and 4 as necessary. Do not overheat tube, use only enough heat to melt the bronze, *not* the steel. When through, the frame should look like the bottom drawing in this step.

Step three

Prepare the front frame section. Apply heat at Points 1 and 2, removing



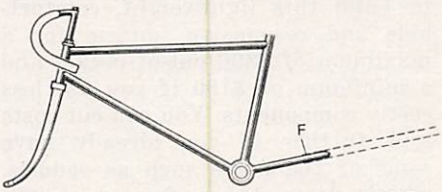


both seat stays from the seat tube first, then removing the seat stays and rear dropouts. When you're through, the frame will look like the drawing above.

Step four

On the front frame section, clean off all paint, grease and dirt from the chain stays down to the bare metal, and for about one-third the length of each stay. Clean another pair of stays from another old frame or new from Proteus (see the parts section). Clean inside of the stays to shiny metal, as well as the outside at least to 3 inches inside of the stays. Braze on these extra stays right over the old stays on the frame, at F on drawing so that you will get extended-length stays.

Don't worry about the length or the spacing of the stays at this stage.



The front frame will now look like it appears in the drawing above.

Step five

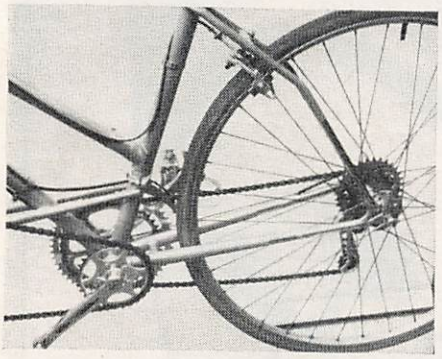
This is an optional step to take if you wish to convert the rear frame to a shorter one. If the rear frame is a 24-inch size (measured from the top of the seat tube to the centerline of the bottom-bracket spindle) and your "stoker" gal is only 5 feet 2 inches, you should have a rear-frame size of around 18 inches for her.

To shorten the rear-frame section: Unbraze the rear-seat stays at the seat-tube lug, then cut off enough of the seat tube to shorten the frame to the size you need and braze on a new seat-post lug cluster. File off the top tube part of the lug; you won't need it. (Always clean lugs and tubes inside and out to the bare metal before brazing them.)

Fill the rear-seat stays with a fine white dry sand and cap them at the top with corks. Unbraze the rear-brake bridge. Carefully, with the torch always in motion and starting about 4 inches below the bridge, bend the stays—one at a time—until the ends come to just below the top of the seat tube. Remove the corks,

dump out the sand, wrap ends of the stays around the seat tube and braze them in place. Rebraze the bridge between stays. The bridge will be at a new angle, so you will have to use a side-pull brake and install it on the front of the bridge instead of the rear, as shown.

You could use an old section of a seat stay—miter it to fit the rear stays, drill it for the brake bolt and install it with the bolt hole parallel to the ground—but that's a lot of work. Bent and brazed stays are shown in the photo below.



Step six

Cut in half the three seat-post lugs noted in the parts section. Clean to bare metal inside and out. Slide one of the lugs upside down onto the rear-frame down tube. Clean ends of the down tube. Slide the other two lugs over the down tube you removed from the rear frame in Step 2. Clean all metal. Lugs should be upside down.

Place the rear frame's top tube alongside the front-frame seat tube with its other end on the rear-seat tube; check to make sure that this tube is mitered so both ends will fit snugly on both seat tubes. If not, re-miter. Now fill front frame chain stays for bending later as shown in Step 9.

Step seven

Align both frames as follows:

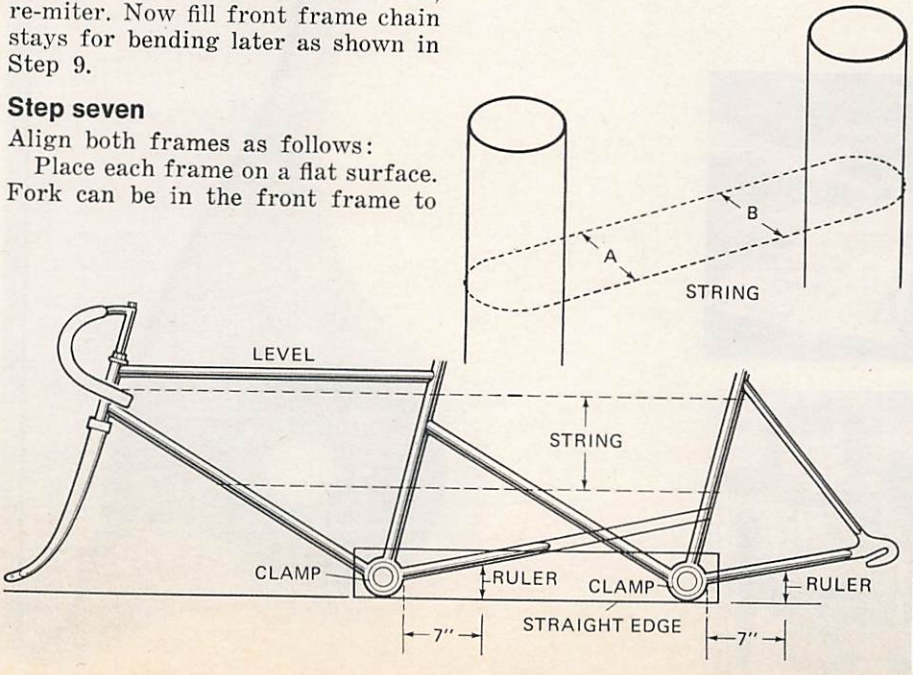
Place each frame on a flat surface. Fork can be in the front frame to help hold it. With level on the front frame top tube, level the front frame. Align both frame bottom-bracket hangars with straightedge on both sides, so hangars are exactly in line with each other. Lightly clamp frames through (or above) the bottom-bracket hangars (be careful not to mangle the bb threads).

Make sure that both sets of chainstays are at the same angle with respect to work surface by scribing a mark on all four stays exactly 7 inches from the bottom-bracket hangars; measure the distance that front frame stays are from the work surface and adjust the rear frame so its chainstays are the same distance from the work surface as the front stays (see drawing). Now when wheels are on the tandem their axles will be the same distance from the ground.

Final frame alignment is done with string. Wrap string at the top of the front frame-head tube so that it parallels and passes both frame seat tubes. Wrap another string about halfway down the front-frame down tube and back to the rear-frame seat tube. Adjust frames on the work surface so that the strings either touch all tubes or are at same distance from all tubes they pass (see drawings). Recheck all other alignments (bottom brackets, head-tube level and stay distance from work surface), make any necessary adjustments and firmly clamp both frames to the work surface. Again, recheck all alignments.

Step eight

Braze the rear-frame down tube to the front-frame seat tube (A on



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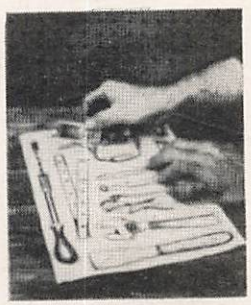

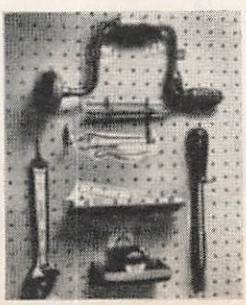

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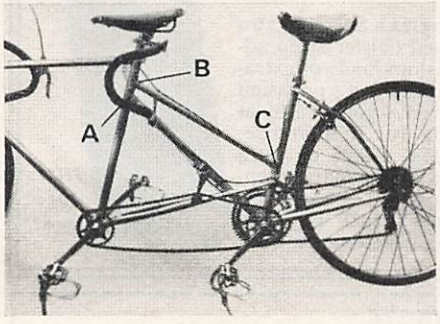
BUILD A BICYCLE FOR TWO

(Continued from page 45)

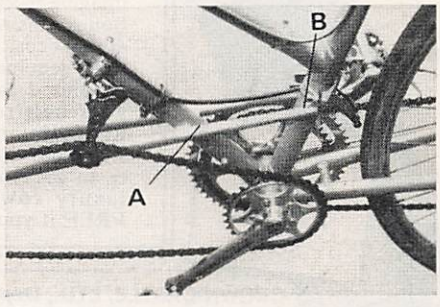
photo), first brazing the tube with a thin fillet, then a lug. After this and



each brazing operation below, recheck alignment at all points. Place the second down tube (formerly the rear-frame top tube) in place with lugs and braze at B and C as above. Be sure that the tube miters fit opposite the tubes snugly before you braze them.

Step nine

In Step six we said that the front chain stays, with brazed-on extensions, are filled with sand. Using a torch, you should carefully and slowly bend each stay, one at a time, until it meets the rear frame bottom-down tube and the seat tube as shown at A and B in the photo. Clamp the parts at both places and braze in position, building up generous fillets at each joint as shown.

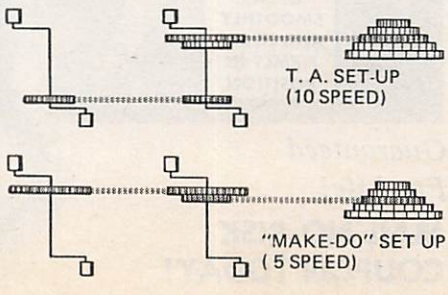


Step ten

Remove all old paint and repaint. See *The Bicycle Shop*, page 14, Feb. '76, for instructions.

Step eleven

Assemble the parts. Step 9 photo shows a chain tensioner, made from a front derailleur and one rear derailleur wheel, installed in place of a chain guide stop on the front derailleur. When the chain is mounted, both sets of pedals must face in opposite directions. The front chain should have about ½ inch of free play. The chain tensioner can be adjusted by sliding the converted front derailleur up and down the downtube. Lateral-chain tension is adjusted with the converted chain-tensioner adjusting screws. The drawing shows the correct chainline for both T.A. and conventional chainwheel sets. The chain line for T.A. is accurate when third rear gear is lined up between the double, rear chainwheel. Conventional chainwheel alignment is correct when rear third gear is in line with inner small chainwheel. Some chainline adjustment can be made by adding or removing thin spacing washers under the rear-wheel freewheel-side axle locknut, thus moving this gear cluster laterally. If you add or remove spacers, the rear wheel should be re-dished for accurate alignment. Assemble all other parts. ★★★



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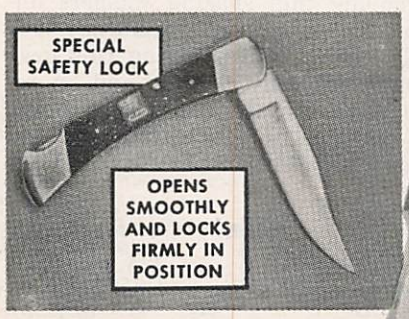

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Three easy craft projects

Here are three simple projects that you can complete in an afternoon; they require little cash outlay, no special skills, yet give a lot of satisfaction

Play apron for your grandchild

No matter how easy it is to toss soiled clothing into a washing machine, it behooves us to take advantage of any protective covering that allows children complete freedom with crayons, paints or modeling clay.

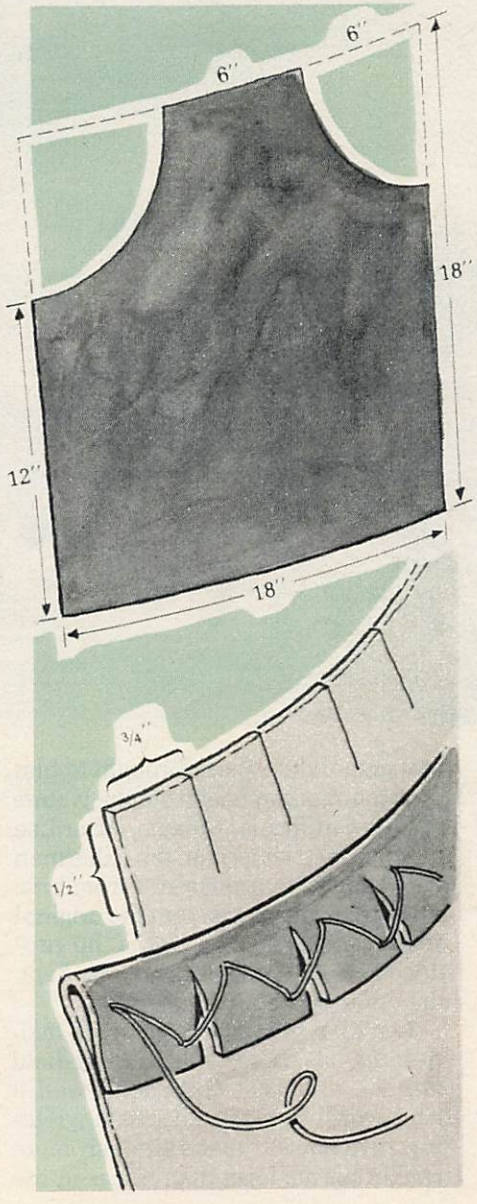
An attractive apron makes playtime more fun for the youngsters and much easier on their jeans, T-shirts and pinafores. Children can paint with abandon and never ruin clothing when it is protected by a colorful cobbler's apron. Such a cover-up is easy to make, even with vinyl material that wipes clean with just a damp cloth.

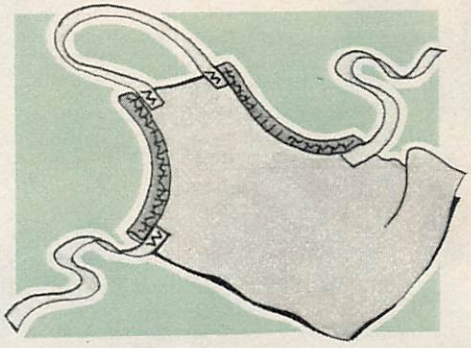
Materials: an 18-inch square of fabric-backed vinyl in a bright color; matching thread; bowl or other round object; scissors; scraps of vinyl in a contrasting color for decoration; 56 inches of narrow twill tape; twine or ribbon; rubber cement.

Cutting apron
Cut the fabric-backed vinyl according to measurements indicated on pattern shown, using bowl or similar object as a guide for making circular cuts for armholes.

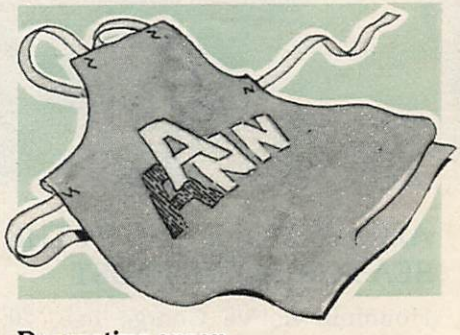
Notching
Make ½-inch cuts at ¾-inch intervals along the two arm cutouts.

Hemming
Turn material wrong side up and fold over notched edge, wrong side to wrong side. Machine stitch, using zigzag attachment if you have one; otherwise, use straight stitch.





Stitching tape
Cut 20-inch length of twill tape. Stitch tape to top of apron. Cut remaining tape in half and stitch at each side of apron, below folded-over edge, to form tie-strings.



Decorating apron
From vinyl scraps of contrasting color, cut letters, using a sharp knife. Design can be ABC, letters spelling out child's name, or whatever. Glue decoration to apron with rubber cement.

Edward W. Hausner / NYT Photo

AT 74, SHE'S CHAIRMAN OF LEGAL AID SOCIETY

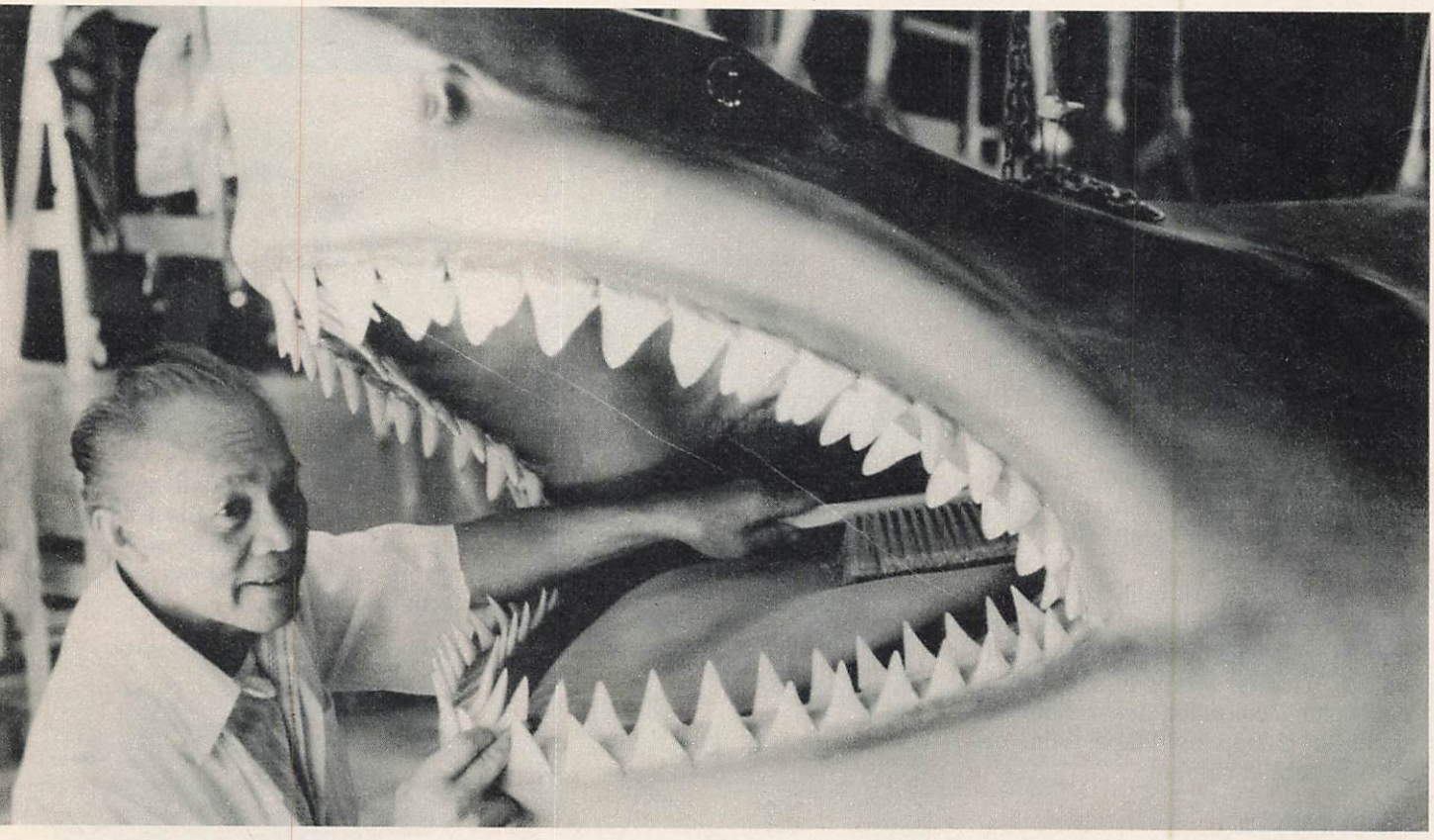
At 74, Helen Buttenwieser of New York is adding a new challenge to her list of achievements. She was recently elected board chairman of the Legal Aid Society, first woman to assume the post in the organization's 103 years.

Buttenwieser was a social worker before returning to New York University Law School, where she received her degree in 1936. A partner in the firm of London & Buttenwieser, she specializes in family law.

In addition to raising four children, she has been involved in numerous volunteer activities. A member of the Legal Aid Society for 42 years, she has also been a director of the New York Civil Liberties Union since 1951 and works with the NAACP Legal Defense and Education Fund.

Helen Buttenwieser credits her ability to be so active to "good health and a good husband." She has been married to Benjamin J. Buttenwieser, a banker, for 50 years. "Right from the beginning," she says, "he was in favor of my working."

For recreation, the couple retreat to their summer home in Mamaroneck, N.Y., where she enjoys reading and sailing. "I love to sit," she says, "and you can read and sail sitting."



ALWAYS MORE FISH IN THE SEA FOR TAXIDERMIST

Honolulu native George Lee, 70, turned his pastime into a business in 1949, and now probably is the world's most renowned fish taxidermist.

Headquartered now in a huge industrial building in Costa Mesa, Calif., Lee has prolonged the moment of action of thousands of fishermen with the mounting of more than 300,000 fish of 250 different species in the past 30 years.

His most exciting mount was a 20-foot great white shark brought to him by a commercial boat from the waters of Baja California, Mexico. After Lee mounted the leviathan, the fisherman who caught it purchased it from him. But Lee made molds from the original shark, and from the molds, he produced two other sharks; one he kept, the other he sold to a museum.

Lee says his success as a fish taxidermist has to do with his long-held attitude—if it isn't worth doing well, it isn't worth doing at all. His unyielding penchant to make the fish more real in his art form than it was in life is very evident in the finished trophy.

"Regardless of the size of the fish," Lee says, "it still takes about 90 days to skin, mount and paint the final product."

He has taught young men all over the world the art of marine taxidermy, and his most receptive students are now his successful agents.

The fish-mounting business for Lee is booming. The older he gets, he says, the more appreciative he becomes of those who recognize his meticulousness.

Dewey Linze

Wind chimes for your home

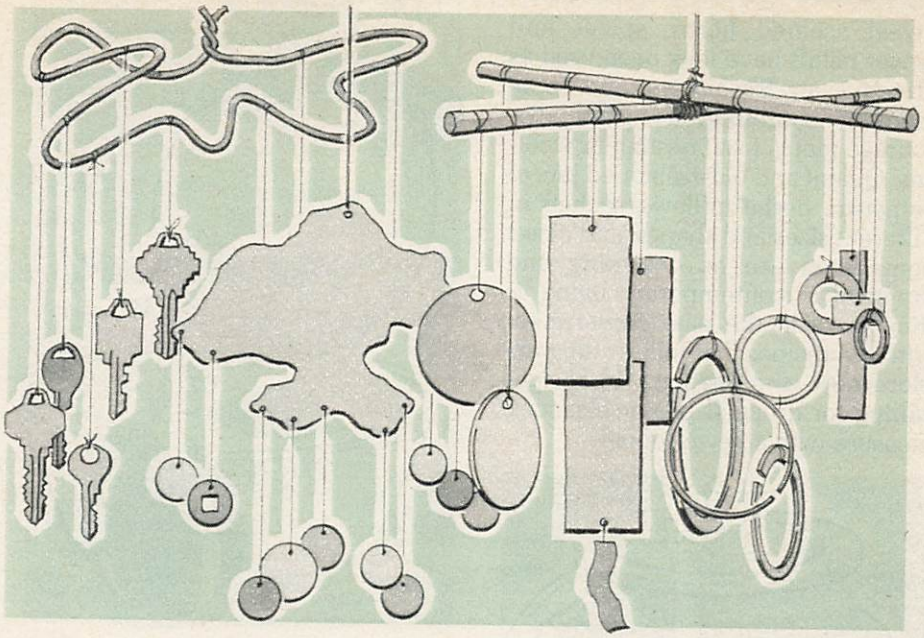
What could be more relaxing on a warm, sunny day than to sit or work in one's garden to the music of softly tinkling wind chimes? Hang these graceful mobiles from an open window, your front door, a tree branch, or any location where they can catch a passing breeze. Wind chimes can be fashioned very easily from a variety of common materials; the possibilities are limited only by your imagination.

The basic components of a set of wind chimes are: a holding piece or sculptural object with appendages from which chimes can be hung and strung (an odd-shaped, gnarled piece of wood, a dowel, or a twisted coat hanger); string, or nylon, silk or cotton thread compatible with the weight and structure of the objects to be strung; visually appealing objects of varying sizes and thicknesses that will produce interesting sounds when struck together (hollow pieces of wood, shells, keys, colored glass pieces, ceramic shapes, coins, or metal shapes cut from cans or aluminum sheeting).

Materials: clear-drying non-water-soluble glue; string or thread; wire coat hanger; gnarled piece of wood; hammer; hand or power drill; awl; scissors; assortment of keys, shells, ceramic pieces, metal pieces. For metal-shapes chimes, you need: an assortment of bottle tops, can tops and bottoms or aluminum sheeting; sandpaper or emery board; outdoor spray paint, if desired.

Making metal chimes

To make metal chimes, gather an assortment of bottle tops, can tops and bottoms, or scraps of aluminum sheeting. Use shapes as they are, or cut your own designs with tin snips or kitchen utility shears. File edges of shapes with sandpaper or emery boards. Place awl near edge of each shape and hammer a tiny hole through thickness of metal. To flatten bottle tops or add textural interest, use a hammer to tap the head of a nail against metal surface for a stippled effect. Metal catches the sunlight strikingly and may be strung unadorned. If you desire more color, spray each piece with outdoor spray paint and let dry according to the manufacturer's instructions.

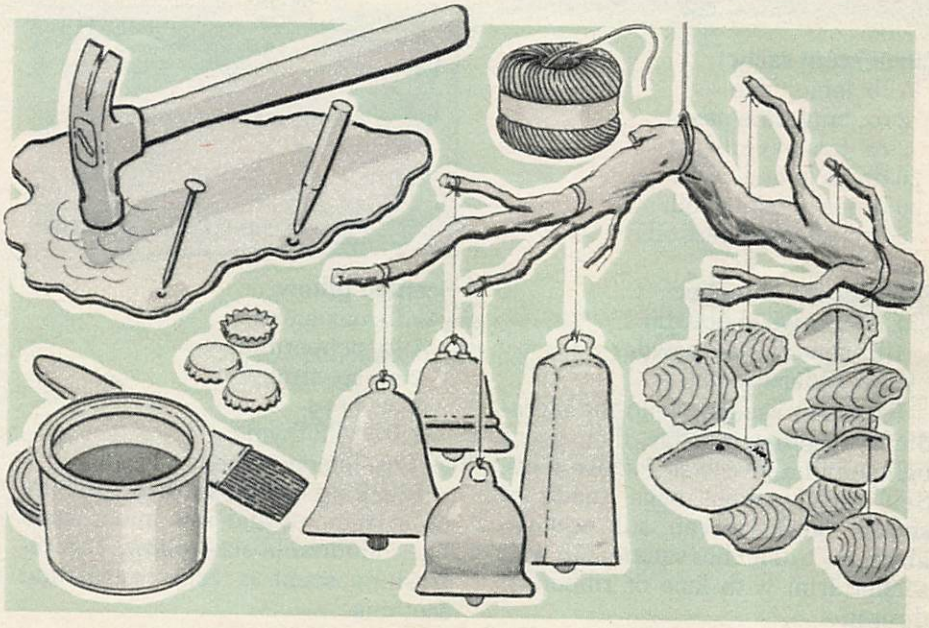


Making holding piece

To make a holding piece from a wire coat hanger, use hands or pliers to bend wire into interesting shapes, then suspend chimes from it; if desired, spray-paint the holder first. If you are using soft wood for your holding piece, use a hand drill to make holes in the wood for suspending chimes. Use an electric drill on hardwood. Saturate string or thread with glue before threading around and through holes in appendages and chimes. Make sure you have a hole in the center top of the holding piece, both for hanging and for establishing a focus of balance.

When suspended chime is at desired length from holding piece, tie overhand knots around and through holes. (Do not tie or thread through center top hole.) Cut away excess string or thread. Chimes should hang fairly close together at varying heights so they touch when set in motion by a breeze. They should *not* be close enough to tangle.

When you are satisfied with your arrangement, pass matching thread or string coated with glue around and through the center top hole in holding piece. To hang chimes, tie ends of string with an overhand knot around a hook, tree limb, or beam.



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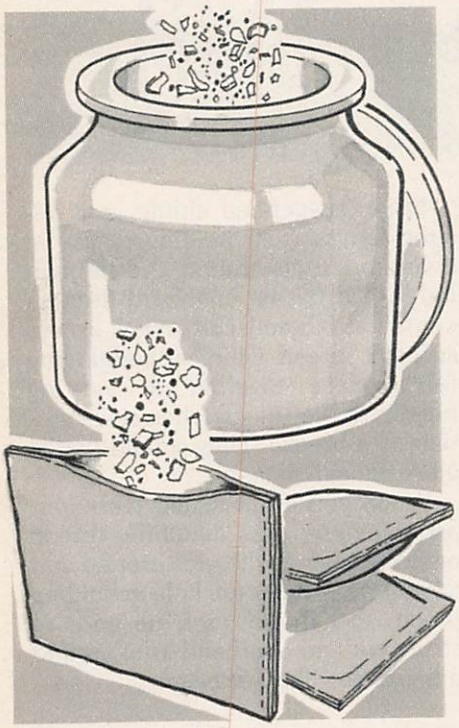
Sachets, potpourris and pomanders for you

Sweet scented herbs, spices and flower petals have long been used as effective air fresheners, and some pungent combinations even discourage moths from nesting in woolens. Quaint and old-fashioned jars of potpourri, herbal pillows, sachets in different sizes and shapes, and closet pomanders are as charming and practical in contemporary living as they were in the past. Experiment with the recipes that follow, then explore new combinations. In recipes calling for drops of oils or essences, measure with an eyedropper.



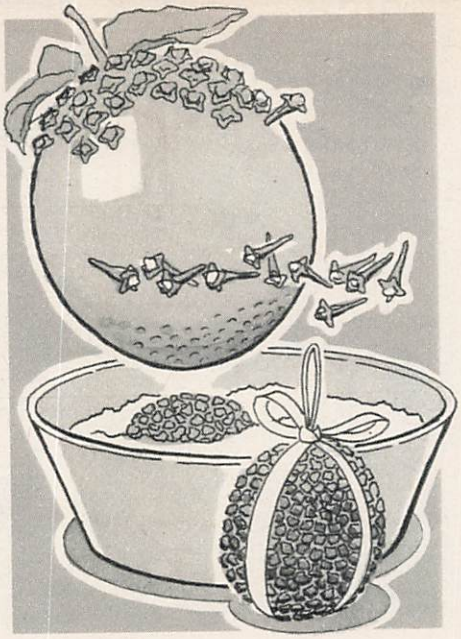
Citrus scent sachet

¼ lb. lemon peel
2 oz. tangerine peel
2 oz. lemon verbena
20 drops lemon oil
20 drops bergamot oil
5 drops lemongrass oil

Fragrant wood sachet

1 lb. rosewood powder
1 lb. sandalwood powder
½ oz. cedarwood oil

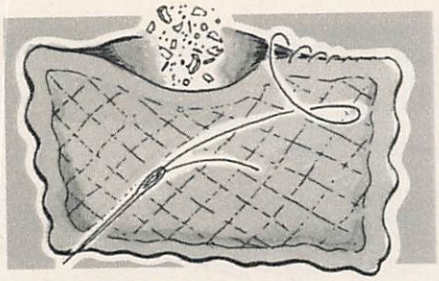
For either sachet, blend the ingredients together in a jar, then cover tightly and allow to sit for five days. Sew small sachet bags, made of small, tightly woven silk squares about 2½ to 3 inches square. Fill with sachet; trim with lace or ribbon, if desired.



Pomander ball

Stud a ripe, thin-skinned orange all over with whole cloves (about 2 oz. per orange). Put the orange in a bowl containing a mixture of orris powder and a blend of ground spices.

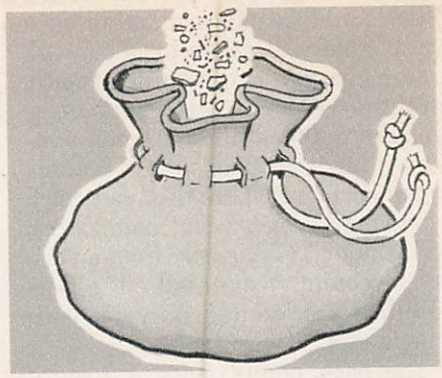
A traditional spice mixture includes cinnamon, allspice and cardamom. A blend of sassafras, star anise, ginger, anise, fennel and cinnamon produces a nostalgic candy scent. Use orris powder with either mixture. Leave orange in bowl for five days, rolling it in mixture daily. When orange is completely dry, wrap ribbon around it; tie with a bow and loop to hang in a closet.



Scented pillow

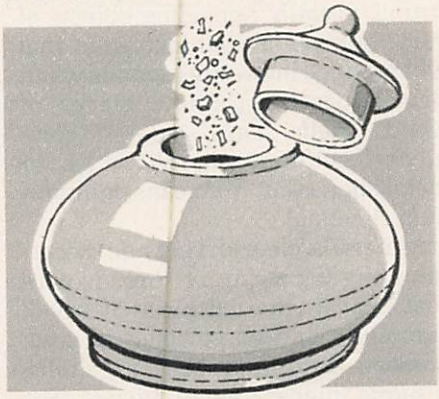
¼ lb. oak moss
¼ lb. peppermint
2 oz. spearmint
2 oz. hops
¼ lb. wild thyme
1 oz. lemon verbena

Break up oak moss, then combine all ingredients and sew into a small but comfortable-size pillow. The refreshing scent is very restful and soothing.



Herbal moth-ball bags

Blend equal amounts of rosemary, tansy, thyme, mint and southernwood, and a few pinches of ground cloves (too many cloves may dominate mixture; use small amount). Put mixture into small sachet bags to tuck in closets and drawers.



Spice and flower potpourri

2 oz. *each* cornflowers, marigold flowers, spearmint, deer's tongue
1 oz. *each* bay leaves, orange blossoms, oregano, lemon balm, peppermint, calamus root
¼ lb. rosebuds
20 drops orris oil
10 drops blue lilac oil

Break up bay leaves, then mix all ingredients together in a jar. Cover, and allow scents to blend for a week or two before filling individual jars.

Romantic potpourri

2 oz. *each* orange peel, dill weed, whole allspice, cassia bark, star anise
1 oz. oak moss
¼ lb. sassafras
10 drops pettigrain oil

Break up sassafras, then mix all ingredients in a jar. Cover, and allow to season for five days. To revive a fading scent, add 4 drops of brandy. □